Design Concept and Test Results of Full Coverage Protection Suit (GKSA)

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Introduction:

About 10 years ago the GAF started experimenting with a full Coverage Protection suit.
The idea was 1. to come along with the bulkiness of several protection suits
2. to find a physiological way of thermoregulation
The secret of the suit is the air flow inside the suit and the distance layer that guarantees a constant flow in all regions. At the same time the trapped air in that distance layer isolates perfectly and gives a buoyancy that makes the suit also perfect for water inmersion.

Main part:

Test results are demonstrated at high temperature (40°C) in the climate control chamber, also at low temperatures dry (+1°C) and wet (+7°C) in comparison with special protection suits.
Sensors are used for skin temperature (including head, fingers, feet), mean skin temperature (Ramanathan), core temperature, humidity between the underware and the suit, blood pressure and heart rate. Psychological tests were carried out every 30 minutes before, during and after the test, also individual opinion how the chosen climate is tolerated according to SAM 136, treadmill test every 30 minutes (1W/kg/body weight). Equipment was weighted before and after the test, urin was examined, blood samples were taken and stress hormones out of saliva were determined 4x during the test.
For the ability as an water immersion suit competitve tests were carried out at the school of sea survival in an indoor pool as well as on the open sea.
For the ability as an BC-protection suit material tests were carried out in the German „BC-Test Centre“ and in the US according to their regulations, also flame retardency test.

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Conclusion:

With this suit we have a system that allowes almost normal physiological thermoregulation because of its principle of air flow.
The protection needed – also in combination – can be produced according to the task the customer looks for - from race car driving over flight envelope to civil use at heat working places, fire brigade, chemical workers and so on. The principle of the suit is an air stream close to the body that allowes normal evaporation. Humidity can be transported away.
For the flying personnel it means that they stay fit to fly the aircraft at it´s and their maximum performance throughout the mission.

Summary:

The optimum to regulate the temperature and humidity while wearing protective clothing is to be – in the applied technique – as close as possible to the physiological way of thermoregulation.

The Full Coverage Protection suit is very close to this aim, several tests under high g, water immersion, cold water, cold air, heat and BC show very promissing results.